Ordering number: EN 1410B

Monolithic Digital IC

SANYO No.1410B

# LB1403N SERIES

## 5-Dot Red/Green LED Level Meter

**Use**

- AC level meters such as VU meters.
- DC level meters such as signal meters.

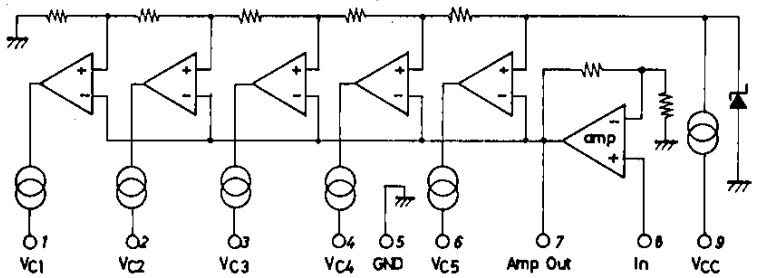
**Features and Functions**

- Capable of generating a bar-display for input voltage with 5 LEDs.
- Operates from either AC or DC input voltage because of on-chip rectifier amplifier.
- Lighting levels remain stable to line regulation because of on-chip voltage reference.
- LEDs are driven by a constant current ; stable to line regulation.
- Power supply voltage range is wide (3.5 to 16V), for a wide range of applications.
- Five types of ICs constitute the series with various lighting levels of the LEDs and driving currents.
- SEP-9 pin package and fewer externally connected components result in smaller space requirements on the circuit board.
- Low noise at LED lighted mode

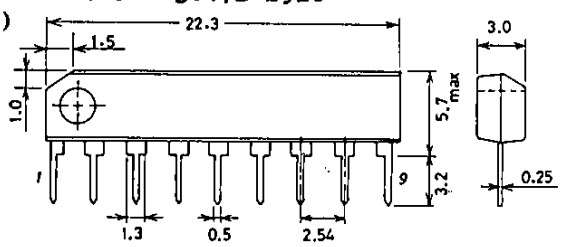
**LB1403N Series**

| Type No. | $V_{C3}$ lighting sensitivity | Comparator level | Constant LED current |
|---|---|---|---|
| LB1403N | 85 mVrms typ | +6dB,+3dB,0dB,-5dB,-10dB | 15 mA typ |
| LB1413N | 105 mVrms typ | 1.67Vc3,1.33Vc3,Vc3,0.67Vc3,0.33Vc3 | 15 mA typ |
| LB1423N | 85 mVrms typ | +6dB,+3dB,0dB,-5dB,-10dB | 7 mA typ |
| LB1433N | 105 mVrms typ | 1.67Vc3,1.33Vc3,Vc3,0.67Vc3,0.33Vc3 | 7 mA typ |
| LB1443N | 85 mVrms typ | +6dB,+3dB,0dB,-6dB,-12dB | 15 mA typ |

**Equivalent Circuit Block Diagram and Pin Assignment**




**Package Dimensions** (unit: mm) 3017B-S9IC




SANYO: SEP9

**Absolute Maximum Ratings**[LB1403N,1413N,1423N,1433N,1443N] at Ta=25°C unit

| | | | |
|---|---|---|---|
| Maximum Supply Voltage | $V_{CC}$ max | 18 | V |
| Allowable Power Dissipation | Pd max | 1100 | mW |
| Operating Temperature | Topr | -25 to +75 | °C |
| Storage Temperature | Tstg | -55 to +125 | °C |

**Allowable Operating Conditions**[LB1403N,1413N,1423N,1433N,1443N] at Ta=25°C

| | | min | typ | max | unit |
|---|---|---|---|---|---|
| Supply Voltage | $V_{CC}$ | 3.5 | 6 | 16 | V |

**Electrical Characteristics**[LB1403N] at Ta=25°C,$V_{CC}$=6V,f=1kHz

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Current Dissipation | $I_{CC}$ | $V_{IN}$=0 | | 5 | 8 | mA |
| Sensitivity | $V_{IN}$ | Vc3 on-level | 74 | 85 | 96 | mVrms |
| Comparator Level 1 | Vc1 | | -11.5 | -10 | -8.5 | dB |
| Comparator Level 2 | Vc2 | | -6 | -5 | -4 | dB |
| Comparator Level 3 | Vc3 | Point of adjustment | | 0 | | dB |
| Comparator Level 4 | Vc4 | | 2.5 | 3 | 3.5 | dB |
| Comparator Level 5 | Vc5 | | 5 | 6 | 7 | dB |
| LED Constant Current | $I_{LED}$ | | 11 | 15 | 18.5 | mA |
| Input Bias Current | $I_{INO}$ | | -1.0 | -0.3 | | μA |

**Electrical Characteristics**[LB1413N] at Ta=25°C,$V_{CC}$=6V,f=1kHz

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Current Dissipation | $I_{CC}$ | $V_{IN}$=0 | | 5 | 8 | mA |
| Sensitivity | $V_{IN}$ | Vc3 on-level | 91 | 105 | 119 | mVrms |
| Comparator Level 1 | Vc1 | | 0.28 ·Vc3 | 0.33 ·Vc3 | 0.40 ·Vc3 | mVrms |
| Comparator Level 2 | Vc2 | | 0.59 ·Vc3 | 0.67 ·Vc3 | 0.75 ·Vc3 | mVrms |
| Comparator Level 3 | Vc3 | Point of adjustment | | VIN | | mVrms |
| Comparator Level 4 | Vc4 | | 1.25 ·Vc3 | 1.33 ·Vc3 | 1.42 ·Vc3 | mVrms |
| Comparator Level 5 | Vc5 | | 1.48 ·Vc3 | 1.67 ·Vc3 | 1.87 ·Vc3 | mVrms |
| LED Constant Current | $I_{LED}$ | | 11 | 15 | 18.5 | mA |
| Input Bias Current | $I_{INO}$ | | -1.0 | -0.3 | | μA |

**Electrical Characteristics**[LB1423N] at Ta=25°C,$V_{CC}$=6V,f=1kHz

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Current Dissipation | $I_{CC}$ | $V_{IN}$=0 | | 5 | 8 | mA |
| Sensitivity | $V_{IN}$ | Vc3 on-level | 74 | 85 | 96 | mVrms |
| Comparator Level 1 | Vc1 | | -11.5 | -10 | -8.5 | dB |
| Comparator Level 2 | Vc2 | | -6 | -5 | -4 | dB |
| Comparator Level 3 | Vc3 | Point of adjustment | | 0 | | dB |
| Comparator Level 4 | Vc4 | | 2.5 | 3 | 3.5 | dB |
| Comparator Level 5 | Vc5 | | 5 | 6 | 7 | dB |
| LED Constant Current | $I_{LED}$ | | 5 | 7 | 9.5 | mA |
| Input Bias Current | $I_{INO}$ | | -1.0 | -0.3 | | μA |

**Electrical Characteristics**[LB1433N] at Ta=25°C,$V_{CC}$=6V,f=1kHz

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Current Dissipation | $I_{CC}$ | $V_{IN}$=0 | | 5 | 8 | mA |
| Sensitivity | $V_{IN}$ | Vc3 on-level | 91 | 105 | 119 | mVrms |
| Comparator Level 1 | Vc1 | | 0.28 ·Vc3 | 0.33 ·Vc3 | 0.40 ·Vc3 | mVrms |
| Comparator Level 2 | Vc2 | | 0.59 ·Vc3 | 0.67 ·Vc3 | 0.75 ·Vc3 | mVrms |
| Comparator Level 3 | Vc3 | Point of adjustment | | VIN | | mVrms |

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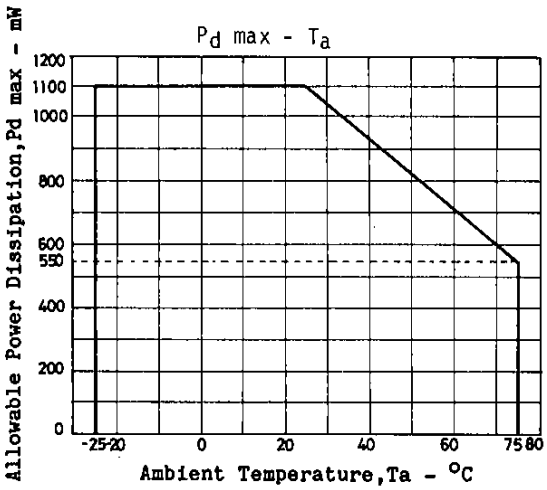
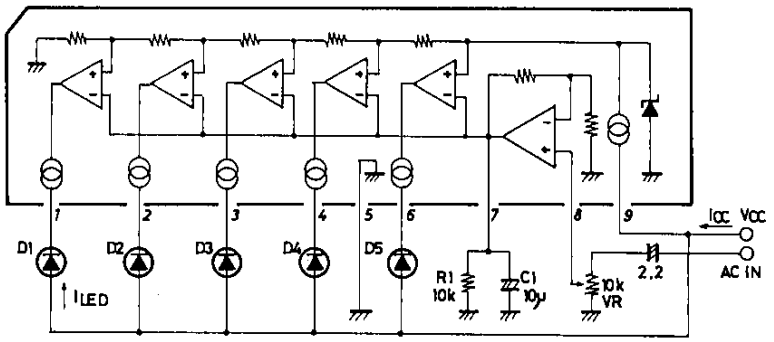
| | | min | typ | max | unit |
|---|---|---|---|---|---|
| Comparator Level 4 | Vc4 | 1.25 ·Vc3 | 1.33 ·Vc3 | 1.42 ·Vc3 | mVrms |
| Comparator Level 5 | Vc5 | 1.48 ·Vc3 | 1.67 ·Vc3 | 1.87 ·Vc3 | mVrms |
| LED Constant Current | $I_{LED}$ | 5 | 7 | 9.5 | mA |
| Input Bias Current | $I_{INO}$ | -1.0 | -0.3 | | μA |

**Electrical Characteristics**[LB1443N] at Ta=25°C, $V_{CC}$=6V, f=1kHz

| | | | min | typ | max | unit |
|---|---|---|---|---|---|---|
| Current Dissipation | $I_{CC}$ | $V_{IN}$=0 | | 5 | 8 | mA |
| Sensitivity | $V_{IN}$ | Vc3 on-level | 74 | 85 | 96 | mVrms |
| Comparator Level 1 | Vc1 | | -14 | -12 | -10 | dB |
| Comparator Level 2 | Vc2 | | -7 | -6 | -5 | dB |
| Comparator Level 3 | Vc3 | Point of adjustment | | 0 | | dB |
| Comparator Level 4 | Vc4 | | 2.5 | 3 | 3.5 | dB |
| Comparator Level 5 | Vc5 | | 5 | 6 | 7 | dB |
| LED Constant Current | $I_{LED}$ | | 11 | 15 | 18.5 | mA |
| Input Bias Current | $I_{INO}$ | | -1.0 | -0.3 | | μA |




**Sample Application Circuit and Test Circuit (AC input VU meter)**




Unit (resistance: Ω, capacitance: F)

※ Capacitor to be omitted when used as a DC-input signal meter.

- $C_1$, $R_1$ time constant:
  The response time can be varied by varying the $C_1$, $R_1$ time constant (mainly the $C_1$ value).

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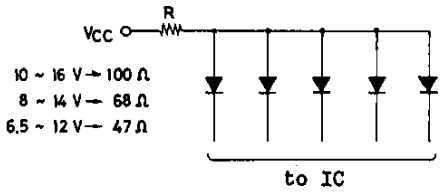
When the $C_1$, $R_1$ time constant is larger:
..... The response time (attack time and release time) is made slower.
When the $C_1$, $R_1$ time constant is smaller:
..... The response time (attack time and release time) is made faster.

. Considerations relative to Pd max of the package:
Due to the constant current $I_{LED}$, most of the power consumed by the circuits is consumed within the IC.
When lighting the five LEDs continuously for a prolonged length of time, make sure that $V_{CC}$ does not exceed:

| | |
|---|---|
| LB1403N, 1413N, 1443N | $V_{CC}$=9V |
| LB1423N, 1433N | $V_{CC}$=14V |

When using a higher power supply voltage, insert a resistor in series with the LEDs to restrain the power consumed within the IC package.

For LB1403N, 1413N, 1443N:




For LB1423N, 1433N: